ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director

via e-mail

November 30, 2017
FPU18-105

Ms. Catherine Jerrard
AFCEC/CIBW
706 Hangar Road
Rome, NY 13441

RE: WAFB – ADEQ comments - *Draft, Soil Vapor Extraction System/Steam Enhanced Extraction System, Operation and Maintenance, 2016 Third Quarter Performance Report, Former Liquid Fuels Storage Area, Site ST012, Former Williams Air Force Base, Mesa, Arizona*; prepared for Air Force Civil Engineer Center (AFCEC/CIBW), Lackland AFB, TX; prepared by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec), Phoenix, AZ; document dated October 20, 2017.

Dear Ms. Jerrard:

Arizona Department of Environmental Quality (ADEQ) Federal Projects (FP) personnel and ADEQ contractor UXO Pro, Inc. reviewed the above referenced document. ADEQ's comments are presented below and on following pages.

General Comments

GC 1: In multiple locations in the text, steam enhanced extraction (SEE) operations are described as "completed." This should be changed to "ceased."

GC 2: ADEQ remains concerned that contaminants mobilized during SEE remedial activities were not captured and may have migrated away from the site.

GC 3: Data collected during the report time period indicate significant contaminant mass remained within or proximate to the thermal treatment zone. Regulatory agencies recommended continuing SEE operation, or at a minimum, after steam injection ceased, continued treatment zone vapor and liquid extraction. The suggested time period extending months to years. However, vapor and liquid extraction were terminated on April 29, 2016 and were not restarted during the reporting period.

GC 4: The presented data do not present correlations between photoionization detector (PID) readings and laboratory data. Therefore, ADEQ and our contractors interpret that PID readings do not provide conclusive data to base remedial action decisions (e.g., using a PID reading to calculate the peak mass extraction rate during SEE).

GC 5: Light non-aqueous phase liquid (LNAPL) accumulation in steam injection wells indicates upper water bearing zone (UWBZ) SEE operations are incomplete. LNAPL removed from wells ST012-UWBZ11 and -15 re-accumulated during the reporting period. These wells were utilized as steam injection wells during SEE.

GC 6: Soil vapor extraction (SVE) optimization discussion should be expanded. Optimization should consider:

6a) Mass removal rate from individual wells
6b) Location of extraction well with respect to contaminated soil volumes.
6c) Location of contaminated soil volumes with respect to well screen interval
6d) Potential to promote dormant or low mass producing wells into vent wells to increase flow through contaminated zones and minimize stagnation zones
6e) Thermal and flame oxidizer operating parameters to maximize the total mass extraction rate while focusing the subsurface flow through the most contaminated soil volumes

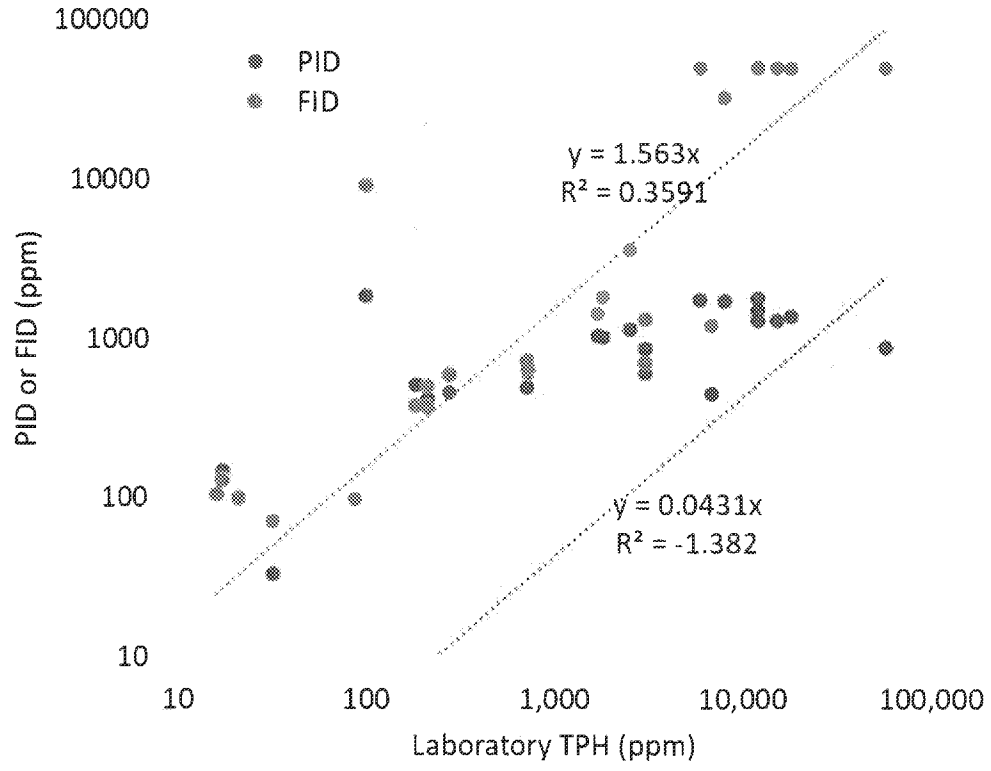
Specific Comments

1. Page 1-1, Section 1.0, Line 113. Please replace the word "completed" with "ceased."
2. Page 1-1, Section 1.0, Line 118. Please replace the word "will be" with "is."
3. Page 1-3, Section 1.3, Line 213. Please edit the sentence to read "Baseline EBR [enhanced bioremediation] sampling activities described in Addendum 2 were also completed during this reporting period."
4. Page 1-3, Section 1.3.1, Line 228. Please edit the text to read "removed approximately 344,000 gallons of fuel contamination."
5. Page 1-4, Section 1.3.2, Line 255. Please edit the text to read "Transition criteria for SEE to EBR were presumably achieved in March 2016. The SEE remedy was ceased on 29 April 2016,"
6. Page 2-1, Section 2.1.1, Line 311. Please edit the text to read, "enabled the thermal oxidizer to operate in catalytic mode."
7. Page 2-1, Section 2.1.1, Line 314. Please edit the text to be consistent with the actual conditions. Line 314 states that the flame oxidizer "remained disconnected for this reporting period"; however, Line 317 states, "On 03 August 2016, the flame oxidizer was reconnected to the SVE system and operated in parallel with the thermal oxidizer. The flame oxidizer remained connected to the SVE system for the remainder of the reporting period."
8. Page 2-9, Table 2-7. Please consider adding a column for the average extraction rate from open wells. The mass extraction rate could then be calculated for individual wells to assess performance and potential optimization strategies.
9. Page 2-17, Section 2.3.1, Line 677. Only laboratory data should be used to calculate mass removed. The text states, "… in April 2016, estimated mass removal for the SVE system was calculated using an alternative method to report on mass removal on a weekly basis. The alternative method uses a correction factor based on available analytical data, collected on a biweekly basis, correlated with PID readings collected on a weekly basis." However, no meaningful correlation appears between the PID Data and Lab Analytical Data from 2015 forward as presented in Figures E-1 to E-33.

   In the table below, fixed-laboratory, total petroleum hydrocarbon (TPH) data presented in Table 2-8 is compared with the PID and flame ionization detector (FID) data presented in Appendix B for the same sample date. These data provide a range of concentrations and compounds for correlating the methods.

Fixed laboratory TPH data from Table 2-8 is compared with PID and FID data presented in Appendix B for the same sample date.				
Sept. 15, 2016	**Lab TPH**	**PID**	**FID**	**Flow**
	ppm	ppm	ppm	scfm
ST012-CZ06	12,000	1,301	>50,000	15.76
ST012-CZ19	17	149	129	174.19
ST012-SVE01S	--	--	534	0
ST012-SVE01M	--	--	95	0
ST012-SVE01D	15,000	1,310	>50,000	20.8
ST012-SVE02S	99	1,864	9,241	47.7
ST012-SVE02M	2,500	1,138	3,632	16.8
ST012-SVE02D	57,000	890	>50,000	9.9
ST012-SVE03S	87	--	98	47.58
ST012-SVE03M	720	622	642	20.32
ST012-SVE03D	18,000	1,391	>50,000	11.22
ST012-SVE04S		361	246	72.49
ST012-SVE04M	210	410	504	39.96
ST012-SVE04D	12,000	1,507	>50,000	24.16
ST012-SVE05S	210	423	375	57.89
ST012-SVE05M	700	499	738	33.27
ST012-SVE05D	12,000	1,781	>50,000	24.58
ST012-SVE06S	21	99	100	30.29
ST012-SVE06M	16	106	106	51.45
ST012-SVE06D	270	465	602	9.92
ST012-SVE07S	--	--	236	0
ST012-SVE07M	180	514	385	13.82
ST012-SVE07D	6,800	456	1,205	23.69
ST012-SVE10	1,800	1,022	1,821	42.6
ST012-SVE11	8,000	1,718	32,646	58.7
ST012-SVE12	1,700	1,048	1,436	93.35
ST012-SVE13	32	33	71	39.01
ST012-SVE14	5,900	1,763	>50,000	78.56
ThermOx In	3,000	605	713	389.27
FlameOx In	3,000	868	1,321	532.22
scfm = standard cubic feet per minute ppm = parts per million				

The following figure presents plotted data points. Neither the PID nor the FID data display correlation with the TPH laboratory data. A similar lack of correlation exists between the PID data and a sum of the BTEX data. Hence, only the laboratory data should be used for mass removed calculation. No remedial performance evaluation or decision regarding a remedial approach change should be based on PID or FID field readings.

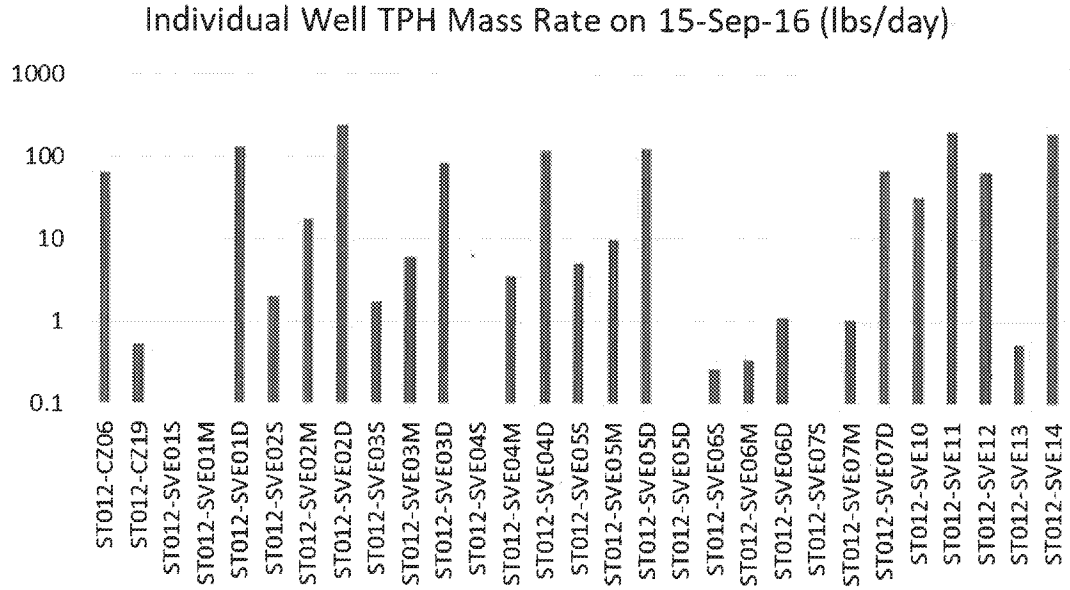


A check of the laboratory and flow data is obtained by calculating a flow-averaged concentration from the extraction well field and comparing it to the measured concentration at the oxidizer inlets. Such a calculation with the laboratory TPH and flow data tabulated above yields a wellfield extraction rate of 1,058 scfm and a TPH of 3,081 ppm from a sum of the measures in individual wells on September 15, 2016. These calculated values compare very well with the measured rates of 921.49 scfm (=389.27+532.22) and measured TPH concentration of 3,000 ppm on the same date.

10. Page 2-17, Section 2.3.1, Line 687. Please provide the method used to determine the PID correction factor. Line 687 states "The results using the alternative method are available in the ST012 weekly reports included in Appendix F." A review of the weekly reports found a correction factor for the PID that varied by an order-of-magnitude during the quarter. If no credible correlation can be demonstrated between the PID and laboratory data, then cease use of the correction factor.
11. Appendix F. Please add the Weekly Reports after 22 July 2016.
12. Page 2-20, Section 2.3.2, line 750. Is the cited concentration of 760 parts per million by volume (ppmv) correct? If so, what is the source? The value presented in Table 2-2 is 1,727 ppmv.
13. Page 2-20, Section 2.3.2, Line 766. Please clarify statements made in the paragraph. Line 766 states "After cessation of SEE operations and reconnection of the deep SVE wells, deep SVE well concentrations increased, but overall TPH concentrations reduced due to the lesser concentrations in wells connected to the SVE system during SEE operations." This sentence states the overall TPH concentrations decreased but the next sentence in the paragraph states the mass removed increased. Please clarify the statements, e.g., was the total extraction rate higher during the quarter?

14. Page 2-21, Section 2.4, Line 800.

a. Please discuss optimization of the SVE system in relation to the following discussion, and consideration of the screen interval and location of each well. Line 800 states "Continue to operate the system and evaluate optimization based on individual well vapor concentrations." The laboratory data and individual well flow measurements for Sept. 15, 2016 (listed in the table with Comment 9) were combined using the equation in Appendix A to calculate the mass removal rate of hydrocarbons on that date. The results are plotted below. Wells producing low mass rates may be creating stagnation zones within more contaminated soil volumes between wells. The highest individual extraction rate is found in well CZ19 but little hydrocarbon mass is produced. Please discuss the potential to turn dormant or low mass producing wells into vent wells to increase flow through the more contaminated soil volumes to optimize operations.



b. Please add a statement and discussion regarding optimization based on the design parameters of the thermal oxidizer and the flame oxidizer. For example, the flame oxidizer should not require any dilution for the reported site conditions such that low mass producing wells could be shut off to increase flow from more productive wells and reduce the number of stagnation zones between wells; however, the thermal oxidizer would then likely require more dilution air. Maximizing the total mass removal rate for the two oxidizers and focusing the subsurface flow through the most contaminated soil volumes is a worthwhile optimization procedure.

15. Page 3-1, Section 3.1, Line 808. Please edit the text to read, "SEE was ceased in April 2016."
16. Page 3-2, Section 3.1.2, Line 850. Please add a sentence stating that wells ST012-UWBZ11 and -15 were utilized as steam injection wells during SEE and therefore the appearance of LNAPL and return of LNAPL after removal was not expected, or explain why it was expected.
17. Page 3-2, Section 3.1.2, Line 853. "LNAPL in MPE [multi-phase extraction] wells that did not return once initially removed may have been present in the MPE wells at the end of SEE but not indicate actual LNAPL in the formation at that location." Please add a statement that it was also possible that LNAPL was present in the formation at that location but immobile under the hydraulic conditions during the reporting period.

Closure

ADEQ may add or amend ADEQ comments if evidence to the contrary of our understanding is discovered; if received information is determined to be inaccurate; if any condition was unknown to ADEQ at the time this document was submitted or electronically delivered; if other parties bring valid and proven concerns to our attention; or site conditions are deemed not protective of human health and the environment within the scope of this Department.

Thank you for the opportunity to comment. Should you have any questions regarding this correspondence, please contact me by phone at (602) 771-4121 or e-mail miller.wayne@azdeq.gov.

Sincerely,
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